

Restoration of Upland Forests Dominated by Loblolly Pine to Longleaf Pine:

Does It Influence Fuel Load, Restore Native Forest Cover, and Reduce Fire Danger

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Project Objectives.

Our objective is to demonstrate changes in fuel load condition as uplands dominated by loblolly pine are restored to longleaf pine forest types in the West Gulf Coastal Plain of the southern United States. First, we are evaluating two conversion treatments: (1) clearcutting and (2) harvesting to a reserved longleaf pine shelterwood. These treatments are being compared to (3) unharvested forest. Treatments 1 and 2 are planted with longleaf pine seedlings.

Second, each of the three treatments is divided for evaluating vegetation management practices: (a) untreated condition, (b) prescribed burning only, and (c) a combination of mechanical woody plant control and prescribed burning. Over time, this will allow us to evaluate how different combinations of treatments influence the management and development of forest fuels, vegetation, and structure on sites targeted for restoration to longleaf pine.

Background.

In the southern United States, the chief influence of burning on landscapes is not how fire influences long-term pine yield but how fire influences overall stand structure and species composition. Without the continual use of fire in natural stands, a forest canopy develops with a basal area dominated by loblolly pine overstory trees. Beneath this canopy is a well developed midstory and understory of woody plants and vines with draped and laddered fuels, and the deep shade and accumulation of litter nearly eliminates herbaceous vegetation.

We have become convinced that on most upland sites a series of preharvest treatments are needed to ensure the restoration of longleaf pine plant communities and lessen the hazard of wildfires on these pyric landscapes. The treatments would mostly involve prescribed burning, thinning prior to final overstory removal, and mechanical brush control where vegetation is too large in stature to control with burning. In total, these treatments should lead to the reestablishment of a herbaceous plant community that will provide a fine fuel bed and generate low intensity fires.

Demonstration Areas.

The demonstration areas are within the humid, temperate, Coastal Plain and Flatwoods province of the West Gulf Region of the Southeast United States and are suitable for the restoration of loamy dry-mesic upland longleaf pine forests. They are located within the boundaries of the Kisatchie National Forest in central Louisiana at an average elevation of 100 to 200 ft above sea level. Slopes vary from 1 to 10%.

The climate is subtropical with mean January and July temperatures of 47° and 82°F, respectively. Annual precipitation averages 60 inches with more than 38 inches during the 250-day growing season, which is from 10 March to 15 November (the spring and fall dates with a 50% probability of a frost).

On this landscape, we established a series of demonstration areas that represent the types of forest cover we are interested in studying (see adjacent site descriptions).

Burned Loblolly Pine Stand

Burn Intensity: 235 °F
Fireline Intensity: 135 BTU/sec/ft or 558 kJ/sec/m

Mixed Loblolly and Longleaf Pine Stands

Burn Intensity: 288 °F
Fireline Intensity: 182 BTU/sec/ft or 781 kJ/sec/m

Plantations in Clearcut Areas and Under Reserved Longleaf Pine Trees

First Growing Season
Planting in a Clearcut

First Growing Season
Planting under Reserved
Longleaf Pine Trees

Burn Intensity: 235 °F
Fireline Intensity: 135 BTU/sec/ft or 467 kJ/sec/m

Burned Plantation of Longleaf Pine
and Pinehill Bluestem

Burn Intensity: 235 °F
Fireline Intensity: 135 BTU/sec/ft or 467 kJ/sec/m

Burned Forest
Burned Forest with
Mechanical Brush
Control
Regeneration
in Gap
Opening

What Needs to be done in this Loblolly Pine Stand

This overstocked loblolly pine stand (see stocking table below) needs to be thinned and repeatedly prescribed burned. If fire cannot reduce the stature of the brush in the understory, mechanical treatments should be applied.

Once the brush is under control, this stand should be clearcut and planted to longleaf pine. Prescribed burning should continue after planting, beginning in the second growing season if possible.

Loblolly Pine Stand

Overstory	DBH (Inches)	Basal Area (ft ² /ac)
<i>Pinus taeda</i>	13.4	83 (81 %)
<i>Pinus palustris</i>	16.5	7 (7%)
<i>Liquidambar styraciflua</i>	6.7	4
<i>Prunus serotina</i>	10.3	3
<i>Cornus florida</i>	5.5	3
<i>Nyssa sylvatica</i>	6.2	2
Midstory		
<i>Pinus taeda</i>	3.8	0.23
<i>Liquidambar styraciflua</i>	1.0	0.01
<i>Carya tomentosa</i>	1.8	0.03
Understory		

Representative common plants are: *Elephantopus tomentosus*, *Hypoxis hirsuta*, *Panicum verrucosum*, *P. anceps*, *Rhynchospora glomerata*, *Tephrosia onobrychoides*, *Gelsemium sempervirens*, *Vitis rotundifolia*, *Rubus* spp., *Quercus falcata*, *Liquidambar styraciflua*, and *Acer rubrum*.

What Needs to be done in the Mixed Pine Stands

This overstocked loblolly and longleaf pine stand (see stocking table below) needs to be thinned. Fire reduced the stature of the brush in the understory, but mechanical treatments may also be needed.

Eventually, the loblolly pine should be harvested and the longleaf pine should be reserved as a seed source. To ensure timely regeneration, longleaf seedlings should be planted under the reserved longleaf stems. Prescribed burning should continue beginning in the second growing season after planting.

Mixed Pine Stands

Overstory	DBH (Inches)	Basal Area (ft ² /ac)
Unburned		
<i>Pinus taeda</i>	17.5	72 (72%)
<i>Pinus palustris</i>	15.7	15 (15%)
<i>Quercus falcata</i>	14.3	6
<i>Quercus marilandica</i>	4.8	1
<i>Prunus serotina</i>	10.0	1
<i>Nyssa sylvatica</i>	8.5	1
Burned		
<i>Pinus taeda</i>	15.4	79 (81%)
<i>Pinus palustris</i>	13.1	15 (15%)
<i>Quercus falcata</i>	5.2	<1
<i>Quercus marilandica</i>	5.3	2
<i>Quercus stellata</i>	5.3	1
<i>Liquidambar styraciflua</i>	6.5	<1
Midstory		
Unburned		
<i>Quercus falcata</i>	2.0	0.05
Burned		
<i>Quercus marilandica</i>	3.1	0.12

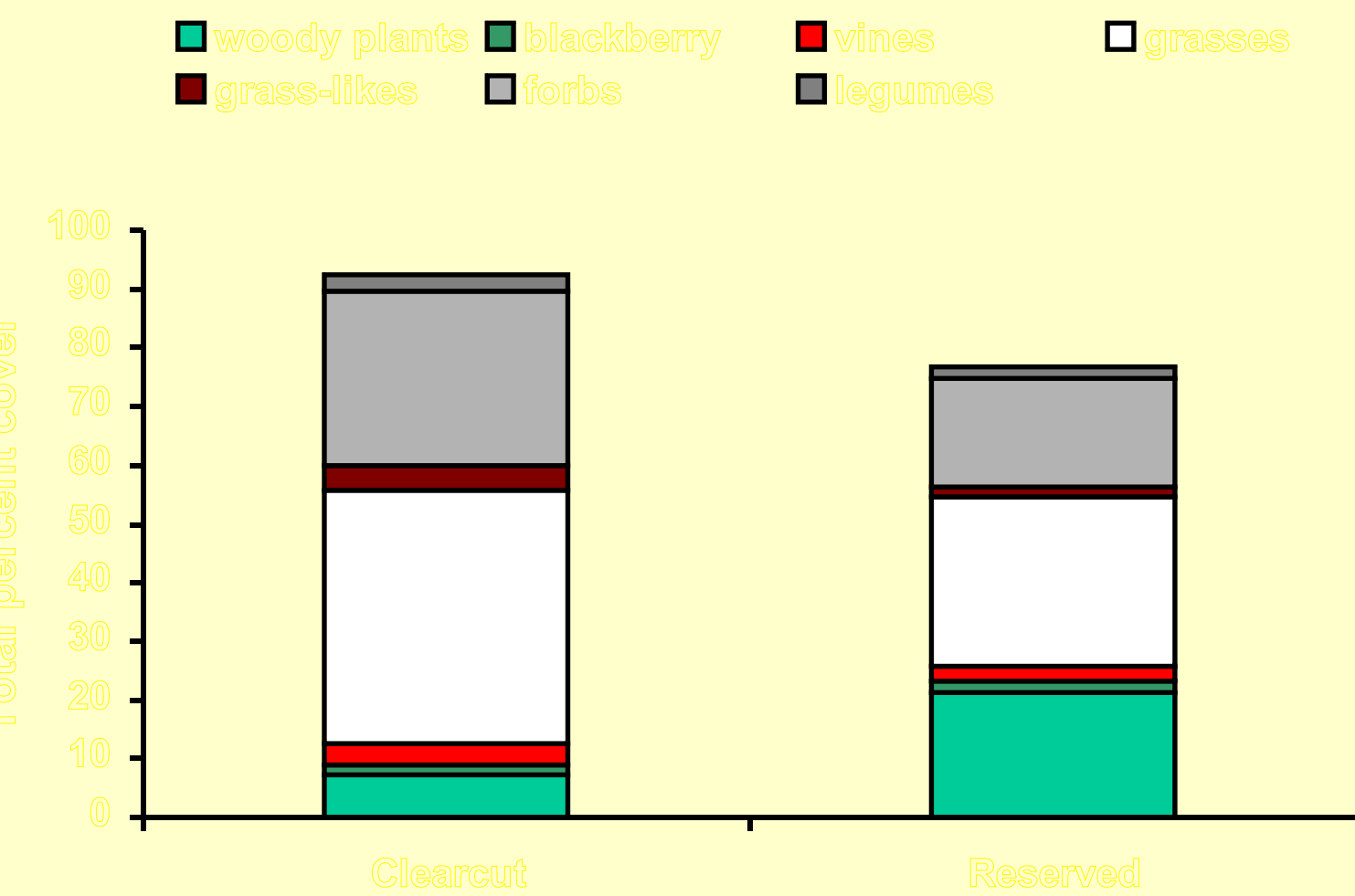
Understory
Representative common plants are: Unburned-*Acer rubrum*, *Callicarpa americana*, *Liquidambar styraciflua*, *Myrica cerifera*, and *Rhus copallina*; Burned-*Eupatorium rotundifolium*, *Panicum anceps*, *Gelsemium sempervirens*, *Liquidambar styraciflua*, and *Myrica cerifera*.

Clearcut and Stand with Reserved Longleaf Pine Stems Planted with Longleaf Pine Seedlings

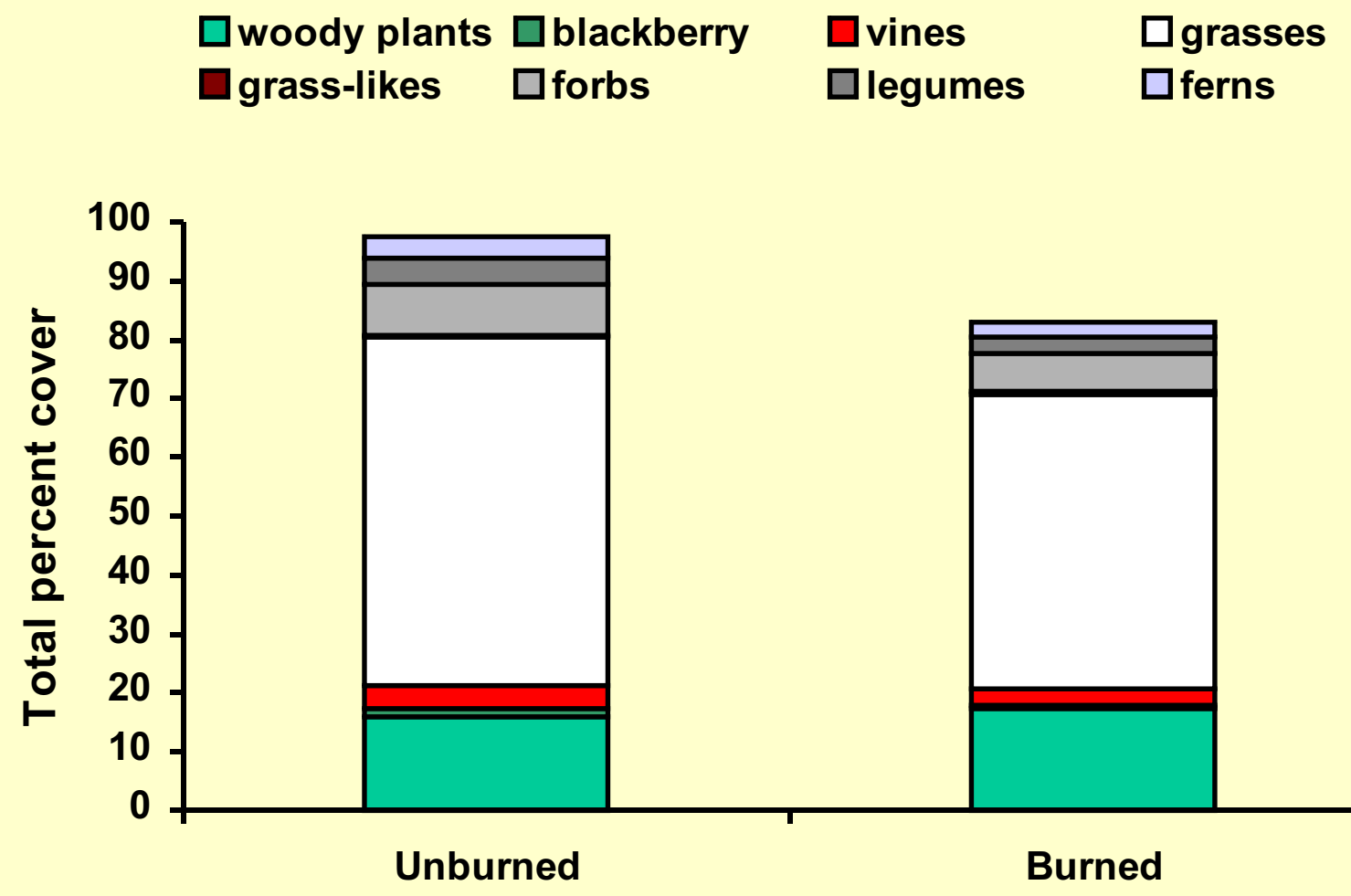
Overstory	DBH (Inches)	Basal Area (ft ² /ac)
Clearcut		
None		
Reserved Longleaf Pine		
<i>Pinus palustris</i>	13.8	30 (+99%)
<i>Quercus stellata</i>	4.2	<1
Midstory		
Clearcut		
None		
Reserved Longleaf Pine		
None		

Understory
Representative common plants are: Clearcut-*Diodia teres*, *Heterotheca graminifolia*, *Dichanthelium aciculare*, *Schizachyrium scoparium*, *Scleria ciliata*, *Desmodium rotundifolium*, *Lonicera japonica*, and *Rubus* spp; Reserve- *Diodia teres*, *Helianthus hirsutus*, *Dichanthelium aciculare*, *Schizachyrium scoparium*, *Carex complanata*, *Stylosanthes biflora*, *Smilax glauca*, and *Quercus marilandica*.

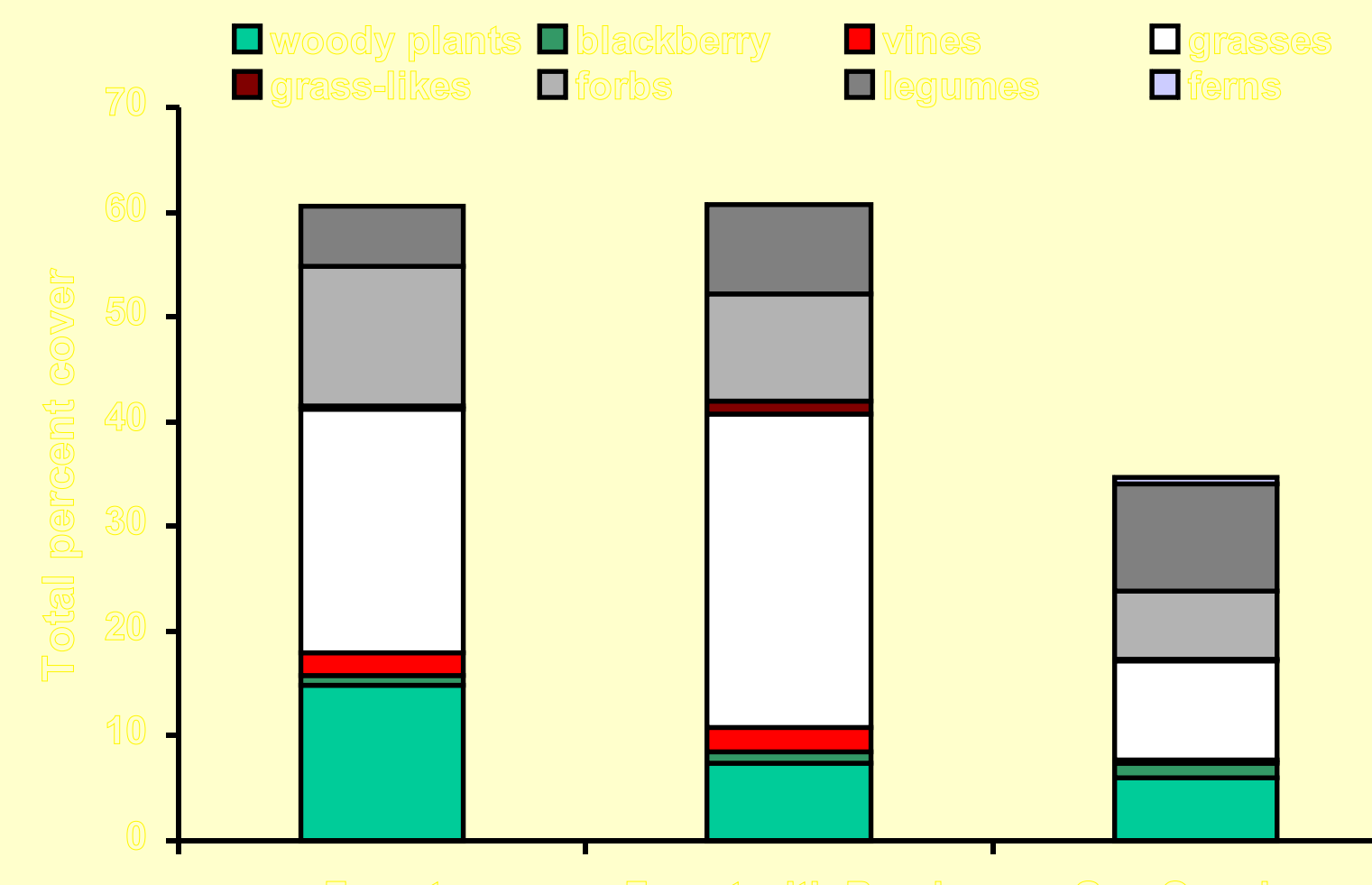
Clearcut and Reserved Stands—Understory Vegetation Classes



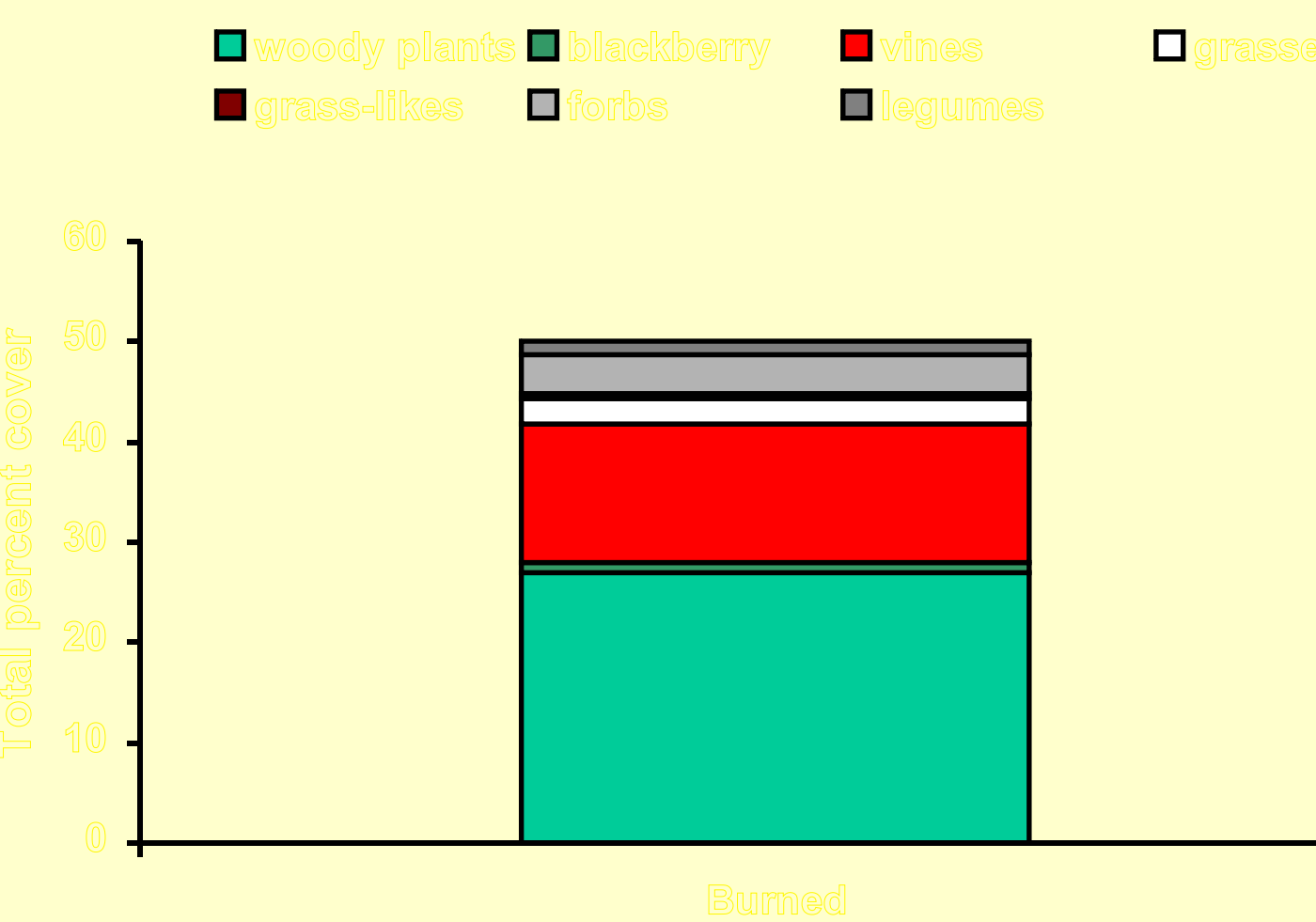
Young Longleaf Plantation—Understory Vegetation Classes



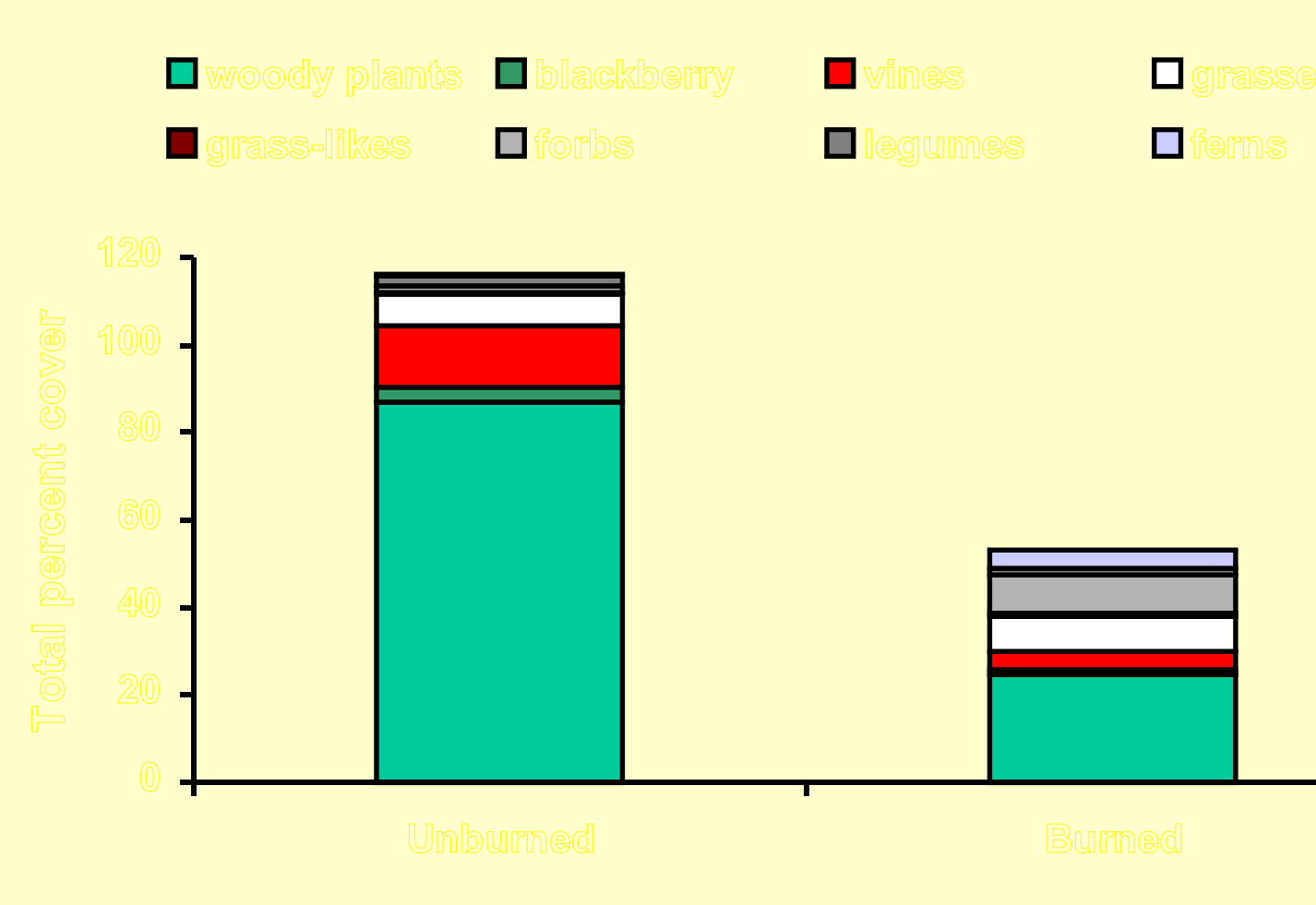
Unevenaged Longleaf Pine—Understory Vegetation Classes



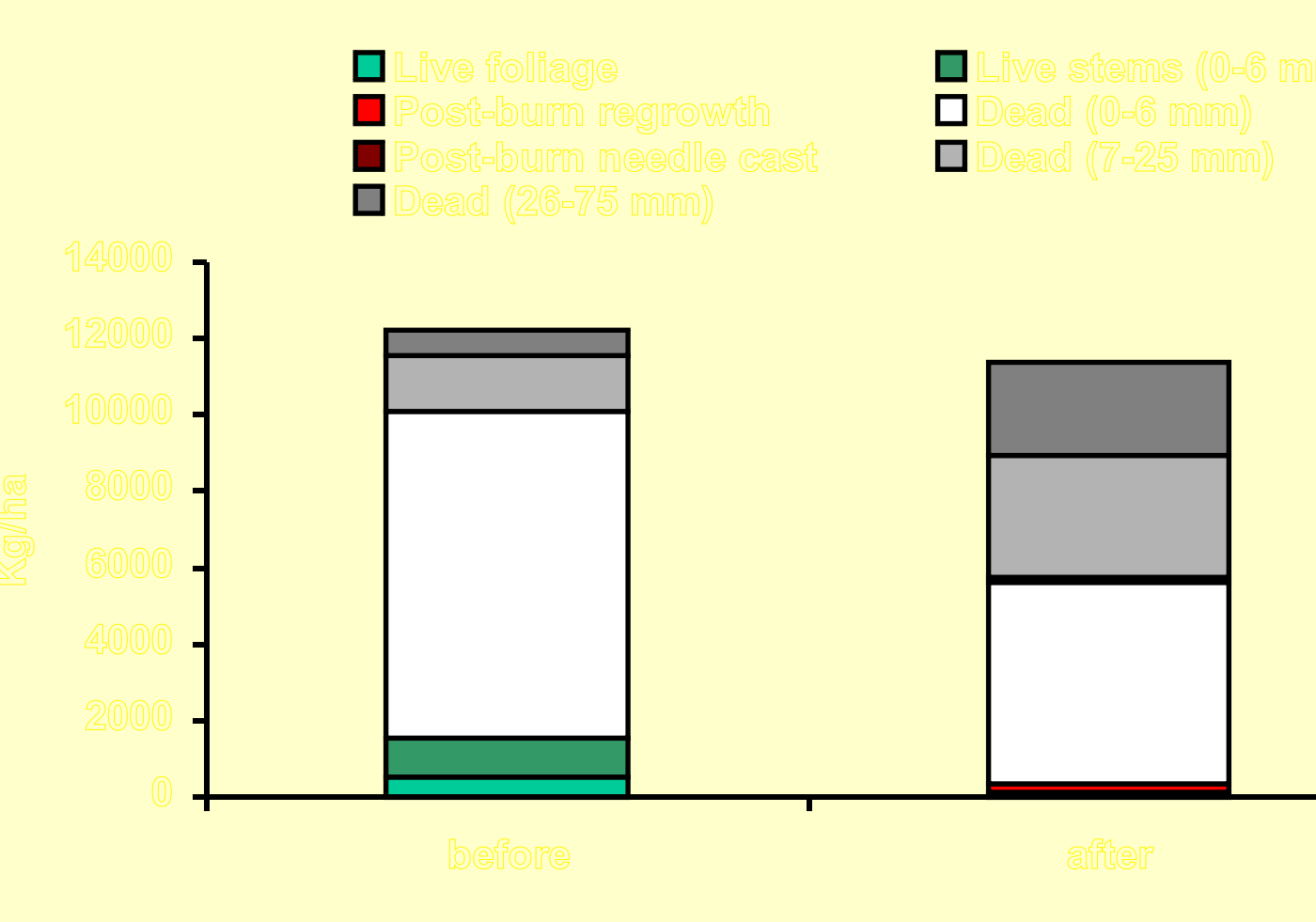
Loblolly Pine Forest—Understory Vegetation Classes



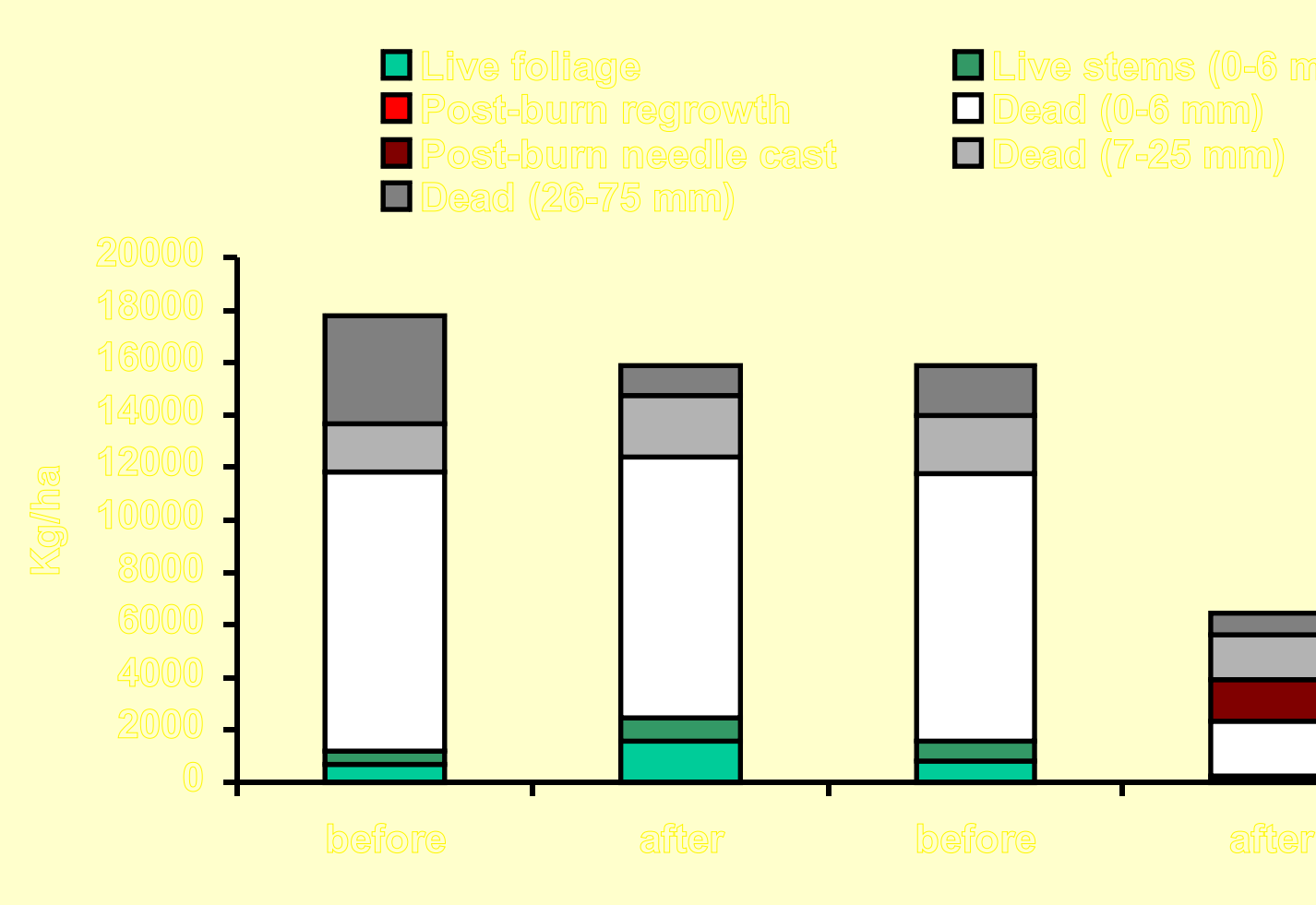
Mixed Pine Forests—Understory Vegetation Classes



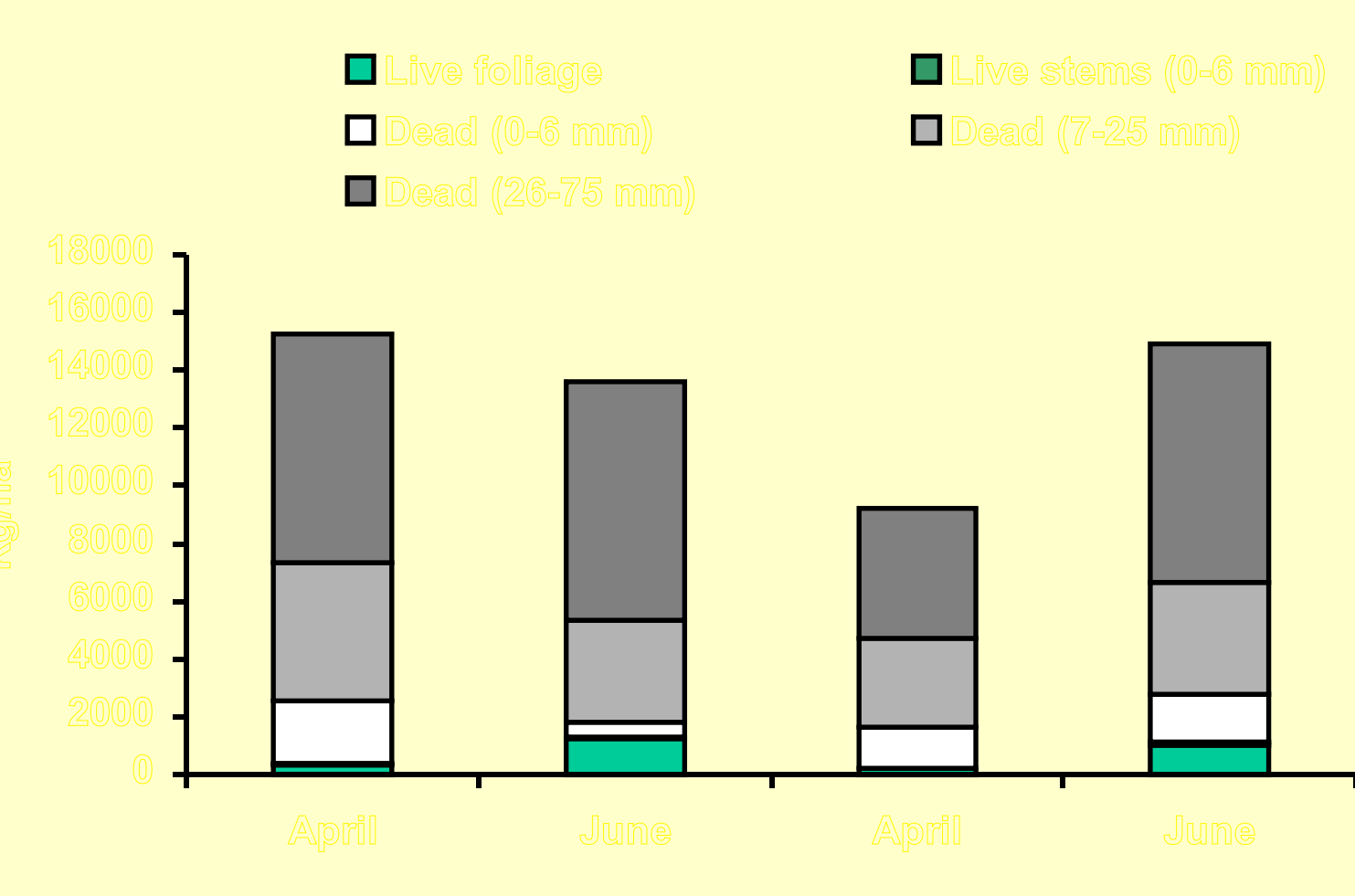
Fuel Loads in a Loblolly Pine Forest Before and After Burning



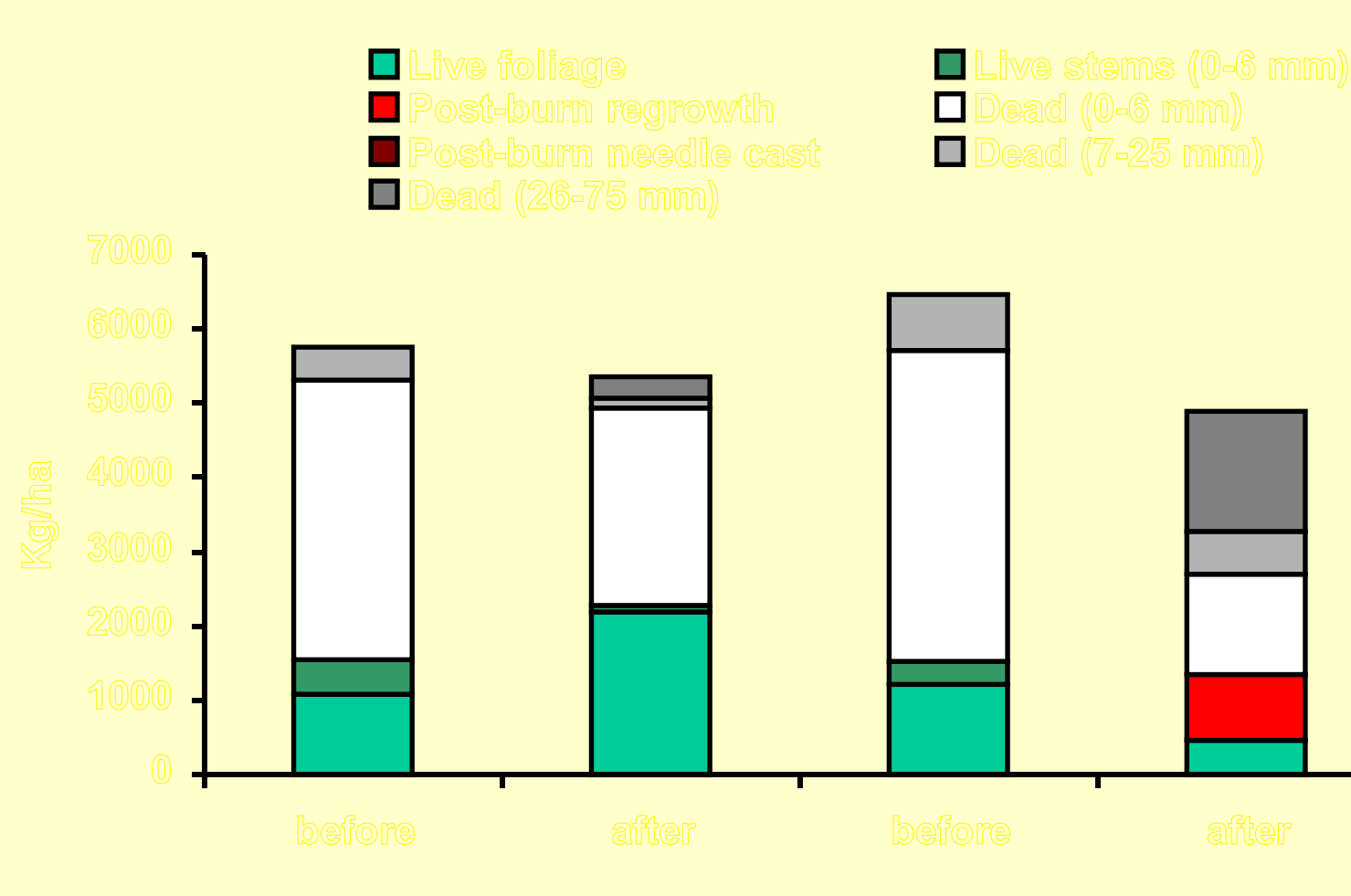
Fuel Loads in Mixed Pine Forests Before and After Burning



Fuel Loads in Clearcut and Reserved Stands Planted in 2001



Fuel Loads in a Young Longleaf Plantation Before and After Burning



Fuel Loads in Unevenaged Longleaf Forests Before and After Burning

